



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/804,179	03/19/2004	Ken Sawada	042256	6768
38834 7590 03/22/2007 WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP 1250 CONNECTICUT AVENUE, NW SUITE 700 WASHINGTON, DC 20036			EXAMINER ESLAMY, MOHAMMAD	
			ART UNIT	PAPER NUMBER
			1709	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		03/22/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/804,179	SAWADA ET AL.	
	Examiner	Art Unit	
	Moh Eslamy	1709	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply:

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03/19/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>06/04</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 18 and 19 rejected under 35 U.S.C. 102(b) as being clearly anticipated by Yang et al. (US Patent No 4654295).

With respect to claims 1, 18 and 19, Yang et al. discloses a method of resist pattern forming on a substrate (claim 8-a, forming a gate electrode upon a substrate); and reacting a chemical liquid (claim 1-c, wetting the photoresist with a solvent) for swelling the photoresist film (claim 1-c, to cause the photoresist to swell) and to reverse-taper (claim 1-c, forming an inwardly tapered surface on the photoresist) a sidewall of the opening.

With respect to claims 18 and 19, Yang et al. further teaches forming on the insulating film (claim 8-b, depositing a thin film of insulating material) and depositing a conducting film (claim 8-d, depositing a second thin film of conductive material), to form an electrode (claim 8-a, forming a gate electrode), forming on insulating film (claim 8-b, depositing a thin film of insulating material) a photoresist film (claim 8-e, depositing a thick film of photoresist).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2, 3, 10-17, and 20, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al. (US Patent No. 4654295) in view of Nozaki et al. (WO 03014830).

With respect to claims 2 and 3, Yang et al. discloses a resist pattern forming method (claim 1 a-c, resist pattern forming method) wherein the sidewall increased upward (claim 1-c, forming an inwardly tapered) is formed.

Yang et al. fails to disclose the hydrophilicity and the chemical liquid affinity of the sidewall.

Nozaki et al. teaches a method of forming a photoresist film, the opening having hydrophilicity and the affinity (page-7, lines 6-12, the film can improve affinity with the resist pattern surface) with the chemical liquid.

Nozaki et al. discloses that method of forming photoresist film is advantageous because the interfacial active agent within the film can improve affinity with the resist pattern.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the photo resist of Nozaki et al. in the resist pattern forming method of Yang et al. in order to improve affinity with the resist pattern.

With respect to claim-10, Nozaki et al. further teaches the chemical liquid contains at least one component of a resin, a crosslinking agent and a surfactant (claim-1, resin and a cross linking agent).

With respect to claim-11, Nozaki et al. further teaches the chemical liquid has water or alkali solubility (claim 1, a resist pattern swelling material which comprises a water or alkali soluble composition).

With respect to claim-12, Nozaki et al. further teaches the surfactant is a non-ionic (claim-1, and a non-ionic interfacial active agent) surfactant.

With respect to claim-13, Nozaki et al. further teaches the resin is at least one material selected from the group consisting of poly-vinyl alcohol, poly-acetal and poly-vinyl acetate (page-4, line 20-24, kind of resin selected from polyvinyl alcohol, acetal and acetate).

With respect to claim-14, Nozaki et al. further teaches the crosslinking agent is at least on material selected from the group consisting of melamine, urea and uryl derivatives (page-4, line 20-24, cross linking agent consisting of melamine derivatives and , urea derivatives).

With respect to claim-15, Nozaki et al. further teaches the chemical liquid contains at least one material selected from the group consisting of water soluble

Art Unit: 1709

aromatic compounds (page-3, line 27-29, a resin composition based on aromatic group such as the novolac resin).

With respect to claim-16, Nozaki et al. further teaches the water soluble aromatic compound is selected from the group consisting of polyvinylarylacetal (page-4, lines 20-25) compounds.

With respect to claim-17. Nozaki et al. further teaches the chemical liquid contains as an organic solvent at least one solvent selected from the group consisting of alcohol, chain ester, cyclic ester, ketone based solvents (claim-3, organic solvent selected from the alcohol based, chain ester based).

Yang et al. fails to disclose the chemical liquid has water solubility, non-ionic surfactant, and resin material is at least selected from the group consisting of poly-vinyl alcohol.

Nozaki et al. teaches a method of using the chemical liquid has water or alkali solubility (claim 1, a resist pattern swelling material which comprises a water or alkali soluble composition), the surfactant is a non-ionic (claim-1, and a non-ionic interfacial active agent), the crosslinking agent is at least selected from the group consisting of melamin (page-4, line 20-24, cross linking agent consisting of melamine derivatives and, urea derivatives).

Nozaki et al. discloses that method of using the chemical liquid with water solubility, non-ionic surfactant, and poly-vinyl alcohol resin base material is advantageous because the chemical liquid can improve affinity with the resist pattern.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the photo resist of Nozaki et al. in the resist pattern forming method of Yang et al. in order to improve affinity with the resist pattern.

With respect to claim-20. Nozaki et al. further teaches the second opening is performed prior to swelling the photoresist film (claim-33, patterning before the swelling).

With respect to claim-22. Nozaki et al. further teaches the electrode extended over the insulating film (claim 8-d, conductive material atop to the semiconductor material).

With respect to claim-23. Nozaki et al. further teaches the second opening is performed after swelling the photoresist film (claim-34, pattern after the swelling).

5. Claim 4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibashi et al. (JP, 10073927) in view of Yang et al. (US Patent No. 4654295).

With respect to claim 4 and 6, Ishibashi et al. discloses a semiconductor manufacturing process wherein a first resist film containing a first base resin is formed (0011, forms the 1st resist pattern); a second resist film containing a second base resin (0011, forms the 2nd resist) is formed on the first resist pattern. The reactivity of first film with the chemical liquid is different from the second resin film (0032, crosslinking reaction is promoted in the interface of the second and first resist film).

Ishibashi et al. fails to disclose the step of forming the photoresist film opening in the second and first resin film.

Art Unit: 1709

Yang et al. teaches a method of forming the opening in the second resin film (claim 8-d) and the first resin film (claim 8-a).

Yang et al. discloses that method of forming the photoresist film opening is advantageous because forming a electrode upon a substrate.

It would have been obvious to one of ordinary skill in the art at the time of the invention to include method of forming the photoresist film opening of Yang et al. in the forming a first and second resist film of Ishibashi et al. in order to include the forming of the photoresist film opening for electrode upon a substrate.

With respect to claim-7, the first and second resist films of the prior art have the same components as the first and second resist films of the present application. Therefor we would have expected they have the same properties including contact angle (MPEP 2112).

6. Claims 5, 8, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibashi et al. (JP 10073927) in view of Anda et al. (JP 11307549).

With respect to claim-5, Ishibashi et al. discloses a semiconductor manufacturing process wherein a first resist film containing a first base resin is formed (0011, forms the 1st resist pattern); a second resist film containing a second base resin (0011, forms the 2nd resist) is formed on the first resist pattern. The reactivity of first film with the chemical liquid is different from the second resin film (0032, crosslinking reaction is promoted in the interface of the second and first resist film).

Ishibashi et al. fails to disclose the step of pre-bakeing the first and second resist films.

Anda et al. teaches a semiconductor device manufacturing process wherein a pre-bake temperature for forming the first resin film is higher than the second resin film (0047, predetermined baking is performed to the 1st resist film and predetermined baking as well as the 1st resist film is performed after that).

Anda et al. discloses method of different pre-bake temperature for forming the first and second resin film is advantageous because predetermined baking is performed to the 1st resist film.

It would have been obvious to one of ordinary skill in the art at the time of the invention to pre-bake the first resist film of the resin at a temperature higher than the temperature of the second resist film based on the teaching of Anda et al.

With respect to claims 8 and 21, Anda et al. further teaches a minimum opening width of the opening is below a resolution of the photoresist film (0037, the opening dimension of the resist film does not exceed the resolution of the resist film).

Therefore it would have been obvious to maintain the minimum opening width of the first resist film of Ishibashi et al. in order to be larger than the opening width of the second resist film based on the teaching of Anda et al. the predetermined baking is performed to the 1st resist film.

7. Claims 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Art Unit: 1709

Yang et al. (US Patent No. 4654295) in view of Anda et al. (JP 11307549).

With respect to claim-9, Yang et al. discloses a resist pattern forming method (claim 8-a, forming a gate electrode upon a substrate) wherein the sidewall increased upward (claim1-c, forming an inwardly tapered) is formed.

Yang et al. fails to disclose required contents of the photoresist film of a novolak or a polymethylmethacrylate based resist material.

Anda et al. teaches a method of the photoresist film contains a film of a novolak-based photoresist (0020, resist containing novolak resin) or a poly methyl methacrylate (claim-3, resist containing polymethylmethacrylate) based resist material.

Anda et al. discloses that method of forming photoresist film is advantageous because the resist film characterized by consisting of a novolak based or polymethylmethacrylate based material.

It would have been obvious to one of ordinary skill in the art at the time of the invention to include the photoresit film method of Anda et al. in the resist pattern forming method of Yang et al. in order to improve the photoresist film process.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Moh Eslamy whose telephone number is 571-272-9811. The examiner can normally be reached on M-F 8.30 to 4.30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



M.E



**BARBARA GILLIAM
PRIMARY EXAMINER**